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# Research Methods for Evaluating Technology-enabled Learning Environments

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**Abstract**—A technology-enabled learning environment should be easy to use by the students and should meet the learning objectives for which it has been included in the course/curriculum. Evaluating the student experience can help in determining the usability and pedagogical effectiveness of the environment. Conducting such evaluations can be challenging in a distance education programme where the students and educators or course designers are not co-located. In this tutorial, we will present a toolbox of data collection and analysis techniques that educators and researchers can apply to evaluate the student experience. We will also discuss the ethical considerations of conducting educational research.

**Keywords:** *e-learning; evaluation; student experience; technology-enabled learning; usability*

## I. INTRODUCTION

An inclusion of a blog in a course to encourage reflective learning, or inclusion of a wiki in a course for collaborative authoring and for fostering team-working skills, or inclusion of activities in a 3D virtual world such as *Second Life* to enable students to learn organic chemistry through 3D simulations are examples of technology-enabled learning environments.

A technology-enabled learning (TEL) environment should be usable, that is, it should be easy to use and navigate. Further, the learning activities designed within this environment should meet the intended learning objectives: for example, does the inclusion of a discussion forum in a distance education course enable students to discuss their queries and receive feedback from their peers?; or do the students find it easy to negotiate, decide and collaboratively develop documents in the wiki?; or does the time it takes to learn to navigate through a 3D space outweigh the benefits it provides in terms of learning the compositions of organic compounds in a chemistry course through 3D simulations in *Second Life*?

In order to evaluate the usability and pedagogical effectiveness of a TEL environment, it is important to elicit students' experiences with and perceptions of the TEL environment. In a face-to-face campus-based setting, student feedback can be elicited through informal conversations, visual cues, and formal mechanisms such as interviews and surveys. In distance-education, there may not be the flexibility to conduct face-to-face interviews or to receive implicit feedback through visual cues or informal conversations.

Over the last five years at The Open University, UK, we have integrated several technologies such as blogs, wikis, podcasts, and *Second Life* in our courses to support distance learners. We have applied techniques such as

surveys, reflective protocols, diary studies, email interviews, interviews over audio/video conferencing tools such as Skype, descriptive phenomenology or narrative enquiry, text-based interviews by using instant messaging tools, interviews and focus groups within *Second Life*, and a combination of these techniques. In addition, we received funding from JISC (Joint Information Systems Committee), UK to investigate the effectiveness of social software in higher and further education in the UK in face-to-face and distance education contexts. In this JISC-funded project, we applied the case study methodology involving educators, students and policy makers to investigate the effectiveness of TEL environments in twenty-six courses in the UK.

In this tutorial, we will share our experiences of applying a variety of techniques to evaluate the effectiveness of TEL environments for student learning and engagement. The concepts and techniques for eliciting student and educator feedback are from disciplines such as Human-Computer Interaction (HCI), social sciences, psychology and education. We will provide a practical guide to applying the techniques based on the literature and our experiences [e.g. 1-4]. We will discuss the individual techniques but also provide guidance through scenarios about how the research question(s) and the evidence requirement inform the choice of technique or a combination of techniques. The chosen technique(s) must answer the evidence requirement – that is, fit for the purpose. The ethical considerations of conducting educational research will be discussed through real-life examples from our experiences and we will provide pointers to resources related to ethics on the Web [e.g. 5]. We will also provide guidance on how to make sense of the data and the process involved in conducting qualitative data analysis by applying the inductive analysis or thematic analysis technique.

## II. OBJECTIVES OF THE TUTORIAL

The tutorial has the following objectives:

- To present a toolbox of methods that educators, course designers and researchers can apply to evaluate the student experience with technology-enabled learning applications
- To discuss the application of these techniques through examples and case studies
- To provide guidance on how to make sense of the data and the process involved in conducting qualitative data analysis techniques
- To highlight the ethical considerations of conducting educational research involving remote participants

- To provide a set of resources such as a list of papers, web resources on ethical guidelines for educational research and, specifically, research of technology-enabled learning applications.

### III. OUTLINE OF THE CONTENT

The tutorial will start with an introduction of the need for evaluating student experience with TEL environments. Real-life examples will be discussed where the feedback from the students on the usability and pedagogical effectiveness of the TEL environments led to the re-design of the user interfaces of these environments and the learning activities that the environments supported. A toolbox of the techniques will then be presented. The usage of each of the techniques will be explained with the help of examples to demonstrate the applicability of the technique to a particular situation or context: such as face-to-face learning versus distance-learners; study level of the students (under-graduate versus post-graduate); the kind of technology in the TEL environment; and the learning activity that is supported by TEL. Participants will be given an opportunity to discuss and justify the choice of the proposed techniques for their contexts in small group-activities.

Finally, the ethical considerations of educational research will be explained. The ethical issues are particularly significant in two situations: (a) when the participants are involved in learning and communicating with fellow students and the educator through online tools in the public domain (e.g. a group on Facebook or a social networking site such as Ning); (b) when the participants and the researcher or the research team are not co-located. The process of integrating ethics in the research design for educational research will be explained through examples and experience stories.

#### A. Presentation style

The two and a half-hours tutorial will comprise of brief lecture segments interleaved with discussions, group activities, and hands-on exercises.

#### B. Intended audience

This proposed tutorial would provide professional development to educators and researchers. The participants will learn new techniques for conducting evaluations of technology-enabled learning applications. The tutorial is not an introductory tutorial on research methods in education but is targeted mainly at participants who have familiarity with traditional research methods in education but would like to learn about the challenges both in the choice of methods and in the ethical considerations of conducting educational research of technology-enabled applications and particularly in distance education settings where the students and educators are not co-located. The tutorial will cover a wide range of educational environments such as Web 2.0 or social software tools such as blogs, wikis, podcasts and 3D virtual worlds.

### IV. EQUIPMENT REQUIRED

A room with an overhead projector, an Internet connection, and, if possible, a white board and flip chart. The presenter will bring her own laptop.

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### ABOUT THE PRESENTER

Shailey Minocha, Ph.D., is a Reader in Computing in the Department of Computing at The Open University (OU), UK. Her research involves understanding users' interactions with technology and investigating the socio-technical contexts in which computer systems operate. Shailey's research and consultancy activities have led to insights into factors that affect usability, user experience and user adoption of technology-enabled systems. Her recent research projects have involved investigating the role of social software (Web 2.0) and 3D virtual worlds (e.g. Second Life) in training and skills development with a particular attention to the virtual team-working, socialisation, collaborative learning and community-building capabilities of these tools. Shailey has authored three requirements engineering and Human-Computer Interaction (HCI) courses at the OU. She regularly conducts tutorials and residential schools for software engineering practitioners in the UK. Shailey is the co-author of the HCI book: 'User Interface Design and Evaluation' <http://tinyurl.com/y8qjt7a> and three chapters from her HCI book have been included in the November 2009 book 'User Experience Re-Mastered: Your Guide to Getting the Right Design': <http://tinyurl.com/ygbrfuuw> Shailey's website has more details of her activities and publications <http://mcs.open.ac.uk/sm577>.

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